Industry partners say they can help

Several of the Signal Corps' command, control, communications and computers defense-industry partners spoke on the symposium's second day about commercial technology. Most of them heavily discussed, or at least touched on, satellite communications.

Speakers included Dr. Irwin Jacobs, founder and chief executive officer of Qualcomm; Jerry DeMuro, vice president and general manager of GTE's government systems communications-systems division; Neil Siegel, director of TRW's military-systems division; Dr. Barry Abzug, vice president of ITT's aerospace/communications division; Dr. Robert Rankine Jr., Hughes Electronics' space division; and Dr. David Klinger, Lockheed Martin's missiles and space division.

Code-division multiple access

Qualcomm products and systems include the transportation-tracking system OmniTracs, satellite system GlobalStar and user-friendly electronic-mail program Eudora, but its work in code-division multiple access is what the company is best known for, Jacobs said. CDMA is, according to Qualcomm's world-wide-web site, "a method in which users share time and frequency allocations, and are channelized by unique assigned codes. Signals are separated at the receiver by using a correlator that accepts only signal energy from the desired channel. Undesired signals contribute only to the noise."

CDMA primarily benefits handheld personal-communications-services equipment and cellular phones. GlobalStar also is CDMA-based, Jacobs said. GlobalStar is a low-earth-orbit satellite that costs less than Iridium, he said, and has greater capacity in its frequency bands. Jacobs said there is a study being done with Defense Information Systems Agency to look at GlobalStar's significance for military usage.

CDMA provides protection against interference. It has 10 to 20 times the capacity of analog, 20 to 40 times if the user employs sectionalization. Since there is no change of frequency in CDMA, it has a "soft handoff" and doesn't drop calls, Jacobs said. CDMA also saves power over frequency modulation; it uses two milliwatts of power vs. 700 milliwatts for FM. The large savings in power, unique to CDMA, would be especially important for battery-powered equipment, according to Jacobs.

CDMA's advantages for wireless data are:

- Capacity;
- Uniform error protection;
- Asymmetric transmission;
- Higher data rates: it's now 14.4 kilobits per second; in the process of going up to 28.8 kbps, 128 kbps and 256 kbps; and in the future (by the year 2000) will go up to one megabit per second or higher;
- Reliable handoff without data gaps;
- Simultaneous voice and data;
- High performance at any vehicle speed;
- Transparent (any existing application that works with a modem will work with CDMA data services); and
- In-phone applications with Internet servers.

Regarding telephone applications with the Internet, Jacobs showed Qualcomm's new "Q" phone and dual-band QCP-820/QCP-2700 phone. The Q phone, advertised on television, has a "mini" worldwide-web browser, transmission-control/Internet protocol and radio protocol. The phone can access weather or travel information and bring up one's calendar, appointment schedule or address book. Jacobs said his plans are to make the Q phone a dual-band telephone. Qualcomm's current dual-band phone, QCP-820/QCP-2700, has analog (800 megahertz) or PCS (1,900 megahertz). Other work on telephones includes the Condor program, which boosts a commercial phone with Type I security, Jacobs said.

"Although people talk about networked computers and they talk about telephones, they're going to be one and the same thing," Jacobs said. "A telephone is always connected to the network and provides both voice and data capability – all in a small digital package."

Commercial technology

DeMuro, who runs the GTE division in charge of the Army's mobile-subscriber equipment program, outlined commercial technology's benefit to Signal Corps efforts. "In telecommunications in particular, the warfighters' needs – that is, building an integrated network enabling vertical and horizontal information exchange in almost any form – are completely in

sync with the demands industry is striving to fulfill on the commercial side," he said. "However, we have to keep in mind, in light of its mission requirements, the military customer has unique requirements itself — exceptional security, more rugged platforms, high mobility, quick deployment, as well as the ever-present issues of power, size and weight. These are key elements of the (military's) strategy, and they're very similar to what we service providers in the information industry are seeking to answer for all our customers."

DeMuro said he didn't believe wireline networks would disappear or that wireless networks would completely "take over."

MSE, a nondevelopmental-item program, represented the military's first move toward commercial-off-the-shelf, DeMuro said. The Army's program called Applique appropriately adapted commercial software. However, GTE doesn't believe "pure COTS" systems can "fully satisfy" military requirements from an environmental, operational and supportability perspective. The military requires that COTS products be made into unique solutions for each user.

Concerns about COTS products, he said, include configuration control; regressive testing; product obsolescence; training and technical manuals; interoperability; battlefield conditions; and the systems' complexity and their network-centric nature.

How should the Army and its defense partners move forward on acquisition strategy? GTE solutions and initiatives include changing its corporate network to be asynchronous-transfer-mode-based. GTE is also supporting a project called Quest, which will link 16,000 miles of OC-192 fiber backbone to more than 125 markets when it's completed.

"My focus is to bring all of this technology to you, the government customer, especially with network-centric solutions to your Enterprise-wide information needs," DeMuro said. "But we want to understand your requirements so we can offer solutions that, as much as possible, leverage COTS products and technologies to help you achieve the (Warfighter Information Network) strategy."

Tactical communications

Siegel, who's part of the organization that's the Army's prime contractor for Force XXI battle-command systems for brigade and below, focused his attention on Army tactical communications for the next decade – especially the tactical Internet in Task Force XXI.

"The tactical Internet is not itself a communications system," Siegel said. "It uses communications devices provided by other portions of the Army. It's intended to be somewhat independent of those communications devices so it can evolve as new communication devices come into play. It represents a strategy and new thinking about how to use those communications devices, be they military-specific devices or COTS devices adapted for military-specific needs."

TI worked well in the Task Force XXI advanced warfighting experiment, Siegel said. Situation awareness worked very well. "Red" situation awareness and command-and-control worked within their expected limitations. The Army and its contractors know TI needs revolution and improvement; lessons-learned in the AWE are already being applied to improve TI.

Besides the technical aspects, Siegel said, the AWE proved the equipment could be user-owned and –operated. Some battalions had contractors to support them, true, but other battalions' soldiers received only training and "did it themselves," according to Siegel.

An important lesson from the Task Force XXI AWE is that the Army "can do a lot with a small amount of bandwidth if it's delivered in the appropriate form," he said.

TI's evolution, now that the Task Force XXI AWE is over, will focus on these areas:

- Fewer autonomous systems / routing areas per brigade;
- Generalized routing only at battalion perimeters and tactical-operations centers, with lightweight intranet routing used internal to each autonomous system;
- Fewer C2 hops, improving the delivery rate, with end-to-end reliable delivery protocol available; and
- C2 georeference data treated like situation awareness. When the C2 message is short, use multicast; unicast will be used only to guarantee delivery or for long messages.

Partnership

Abzug spoke on achieving information superiority through partnership. To examine the topic, he asked what partnership means. To answer this required three questions concerning the command, control, communications and computers defense industry's health.

"First question: will the soldier's warfighting needs and the commercial marketplace's requirements converge enough that they're essentially the same market? In other words, will the same radio, the same (personal computer), the same networking software, the same system, that sells in the commercial market meet the rigors of the battlefield?" Abzug asked. "If not – and now comes the second question – will providers of commercial products generally find it in their interest to divert discretionary investments and resources to understand and meet the defense market's unique attributes? Will (commercial providers) spend their money understanding what the soldier needs?

"The third question – the final question: will military acquisition policies and strategies recognize enough value from the C4 defense industry to support it into the next century? Depending on the answers to these questions, there may not be a C4 defense industry, and in that case, the notion of partnership with industry as we know it today really doesn't make a lot of sense. On the

other hand, if the answers suggest that a C4 defense industry is sustainable and necessary to acquire, tailor and integrate commercial technologies and products into unique solutions for warfighters, then there will be … may always be … a defense industry to partner with the Army. So, which way will it go?"

Commercial product developers must understand their military user's requirements in depth, Abzug said. If the partnership of industry and the Army is to be healthy in the future, the Army needs a defense industry committed to serving it. There are financial risks to this partnership; Abzug asked his Army listeners to recognize these risks.

He outlined from ITT's products some examples of its healthy partnership with the Army. The handheld multimedia terminal was an ITT initiative that he said would replace much of the TI systems. Dragonfly, which ITT began working on without government requirements or funding, was ITT's solution for the military's need to transmit classified data; Dragonfly will keep down hackers' and adversaries' impact on the Army's secure systems. Understanding its military customer's mission enabled ITT to come up with these two solutions in response to anticipated requirements, Abzug said.

According to Abzug, the military's defense partners have some issues to work out with the Army, including technical leveling; acquisition restrictions; insistence on intellectual property rights for the government when property was developed with private funds; or shifting the research-and-development burden to industry for technology demonstrations. Sometimes the government is "stretching its industry partners really thin," he said.

Commercial satellite communications

Rankine, a retired Air Force major general, shared his expertise on leveraging commercial satellite communications for the warfighter. "I believe there are four ways the military can benefit from progress in commercial satellite communications," he said. "First, the military can save time and money without sacrificing reliability or performance by adopting commercial satellite-acquisition and manufacturing practices. These benefits are being sought under the (Defense Department's) single-process initiative. Second, technology developed for commercial SATCOM applications can be applied to military-owned communication satellites … for example, the recent application of direct-TV technology to create a military Global Broadcast Service.

"Third, the military can purchase and use COTS equipment … for example, the Air Weather Service's use of commercial VSAT equipment to distribute weather data to air bases. And fourth, the military can lease commercial-communications satellite capabilities on a fee-for-service basis … for example, the military use of Inmarsat."

The military would save money, improve cost-effectiveness, reduce acquisition-cycle time, improve performance and make improved technological capability available earlier if the military adopts commercial SATCOM applications, according to Rankine.

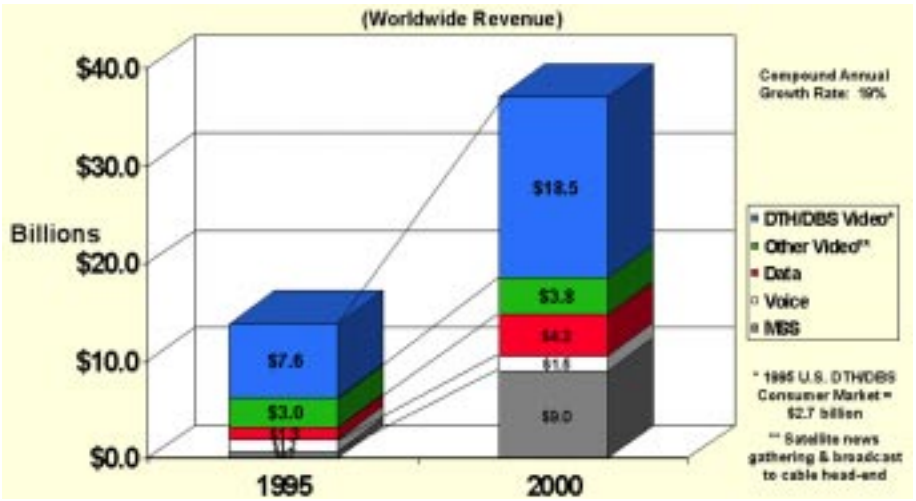

Figure 14. How the global commercial-satellite-services industry is projected to grow. Source: Teal Group, reprinted in *Space Business News,* March 9, 1997, and AT Kearny Industry Reports, reported in *Satellite News*, Aug. 26, 1997; adapted from Rankine briefing.

The military can do more to leverage commercial infrastructure and services to meet its day-to-day requirements as well as surge needs. Military SATCOM systems are essential to provide assured communications for the force-projection Army, Rankine said, with commercial systems as augmentation.

According to Rankine, commercial SATCOM isn't well suited for:

- Local point-to-point communications;
- Operation in a jamming-threat environment;
- Allowing massive system reconfigurations to support a major regional conflict; or
- Rapidly deploying fixed-satellite-service connectivity (exception: where host-nation agreements have already been negotiated).

The global commercial-satellite services industry is projected to grow 19 percent per year, Rankine said, with the Army only "a sliver of the pie" for future SATCOM usage. That's why it's crucial for the military to adopt commercial systems, he said.

Rankine recommended this military SATCOM acquisition strategy:

- Fixed price + incentive;
- Clear performance-oriented specifications, similar to commercial,

"as opposed to telling us how to build the satellite";

• Leverage commercial capabilities, processes, technologies and business practices;

• Delivery-in-orbit with contractor-provided ship, process and shoot; and

• Commercial services as a capacity "safety valve."

SATCOM future

Klinger echoed some of Rankine's comments about the military not being the biggest satellite user. The Army would have 5 percent of total Global Positioning System satellite use, he said. However, focusing on GPS, DSCS and Milstar, Klinger outlined Lockheed Martin's satellite programs and the three "core programs" supporting the military today.

Since his notes on GPS Block IIR satellites have been covered in TSM-SATCOM updates for previous ***Army Communicator*** editions, this article won't cover that information again. Klinger said 21 Block IIR satellites would be in orbit by 2000. DSCS — a "vintage" but important backbone – has 10 satellites in its current constellation with a satellite's launch last fall. The latest DSCS satellites offer a 200 percent to 700 percent increase in capability.

As LTG William Campbell mentioned in his briefing, the Joint Requirements Oversight Council approved purchase of three super-high frequency / Ka gapfiller satellites. Klinger said the gapfillers will be the DSCS program's next step. Acquisition will start in 2001, with launch in 2004. There will be changes to terminals required as well. Since terminal changes will be largely commercial, the Army's partnership with industry on these has started "in a big way."

Milstar II's first launch will be in January 1999 and will offer MSE and range extension. Klinger said the full Milstar constellation would be in orbit by 2002.

The SATCOM industry is moving into space telephony with GlobalStar and Iridium, for example, Klinger said. What's coming next is the advanced extremely-high frequency satellite, which will have more than 10 times the capacity. The more advanced satellites will offer switched bandwidth – an "Internet in the sky" – which the user can dial up when the satellite is needed and shut down when it isn't.

"These commercial systems are evolving. Many of them are still on paper," Klinger said. "There's much opportunity for the military to get involved at this time in working with us as industry, making sure we understand the requirements the military might have on these so we can factor that in. Sometimes it's just as easy to design something this way as that way. One (way) may just obviate (the military's ability to use the technology). Another way, it might be very easy to have a commercial system that can be easily transported into the final military system.

"There's a lot of exciting things going on in space," Klinger said. "I look forward on this partnership basis to working back and forth with information, helping us meet your needs and you understanding where we're coming from on it so we can provide the very best systems for you."

Acronym Quick-scan

AWE – advanced warfighting experiment
C2 – command and control
C4 – command, control, communications and computers
CDMA – code-division multiple access
COTS – commercial-off-the-shelf
DSCS – Defense Satellite Communications System
FM – frequency modulation
GBS – Global Broadcast Service
GPS – Global Positioning System
Kbps – kilobits per second
MSE – mobile-subscriber equipment
PCS – personal-communications services
SATCOM – satellite communications
SHF – super-high frequency
TI – tactical Internet
TSM – T(raining and Doctrine Command) systems manager